

CLAIMS

What is claimed is:

Claim 1. A kit for creating a spinal fixation assembly comprising:

a polyaxial bone screw having a first end constructed and arranged for threaded engagement in a spinal bone by application of an effective amount of rotational torque, and a second end constructed and arranged for swivelable attachment of a linking member, said linking member having a first end constructed and arranged for attachment of a connecting member and a second machined end constructed and arranged for swivelable attachment to said second end of said bone screw;

a connecting member constructed and arranged for adjustable positioning about said linking member machined end; and

a linear fastener constructed and arranged to provide positive compressive attachment of said connecting member and said linking member machined end;

whereby application of a non-rotational, linear force to said linear fastener fixedly engages said fastener about said linking member machined end to produce and maintain clamping force effective to produce a spinal fixation assembly having a fixed orientation.

1 Claim 2. The spinal fixation assembly kit of claim 1
2 wherein said bone-screw member has a substantially-spherical
3 second end, said spherical external end having a surface which
4 is constructed and arranged to cooperate with a support collar,
5 said support collar including a substantially spherical first
6 surface and a generally flat second surface, whereby engagement
7 of a linear engaging fastener supplies a clamping force to said
8 support collar for locking said linking element in a chosen
9 orientation.

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11 Claim 3. The spinal fixation assembly kit of claim 2
12 wherein said linear fastener includes;

13 a collet member having a base end, a top end, an inner
14 engaging surface, and an outer tapered compression surface
15 positioned about a central axis;

16 a compression ring member having a base end, a front end,
17 an inner tapered compression surface, and an outer surface
18 positioned about a central axis;

19 wherein said inner tapered compression surface of said
20 compression ring member is constructed and arranged for coaxial
21 alignment and overlapping engagement with respect to said
22 outer tapered compression surface of said collet member, said
23 compression ring member linearly traversable with respect to
24 said outer tapered surface of said collet member between a

1 first release position and a second engaged position, wherein
2 said collet member is placed over said first end of said
3 linking element in said first release position and wherein said
4 engaged position results in said cooperating tapered surfaces
5 compressing said collet member and tensilely loading said
6 compression ring member thereby supplying said clamping force
7 and gripping the outer surface of said linking element.

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9 Claim 4. The spinal fixation assembly kit of claim 3
10 wherein said first end of said linking member includes a
11 tensioning means; wherein said tensioning means is constructed
12 and arranged to allow said linking member to be tensilely
13 loaded prior to linear traversal of said compression ring
14 member to said engagement position with respect to said collet
15 member.

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17 Claim 5. The spinal fixation assembly kit of claim 4
18 wherein said tensioning means includes at least one groove
19 extending around the circumference of said first end of said
20 linking element, wherein said at least one groove is
21 constructed and arranged for gripping and placing a tensile
22 load on said linking member prior to linear traversal of said
23 compression ring member into said engagement position with
24 respect to said collet member.

1 Claim 6. The spinal fixation assembly kit of claim 4
2 wherein said linking member tensioning means includes at least
3 one internal bore extending inwardly from said first end along
4 the longitudinal centerline of said linking member, wherein
5 said at least one internal bore is constructed and arranged for
6 gripping and placing a tensile load on said linking member
7 prior to linear traversal of said compression ring member into
8 said engagement position with respect to said collet member.

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10 Claim 7. The spinal fixation assembly kit of claim 6
11 wherein said internal bore includes threads.

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13 Claim 8. The spinal fixation assembly kit of claim 4
14 wherein said tensioning means includes a frangible stem,
15 whereby said frangible stem is severed from said first end of
16 said linking element when said linking element reaches a
17 predetermined tension, wherein said frangible stem is severed
18 subsequent to linear traversal of said compression ring member
19 into said engagement position with respect to said collet
20 member.

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22 Claim 9. The spinal fixation assembly kit of claim 1
23 wherein said first end of said bone-engaging member has screw
24 threads to engage said bone.

1 Claim 10. In an anchoring assembly for use with a spinal
2 fixation system, said spinal fixation system including at least
3 one spine stabilizing rod and at least one connector adapted to
4 selectively engage said at least one stabilizing rod;
5 a linking member having a machined first end and a
6 substantially-spherical second end, said machined first end
7 being sized to engage said connector;
8 a bone-engaging member having a first end adapted to
9 engage said bone and a second end comprising a retention cavity
10 constructed and arranged to engage said linking member second
11 end, said retention cavity having a substantially-spherical
12 exterior surface;
13 a linear engaging fastener means for attaching said
14 linking member first end to said connector;
15 whereby said linear engaging fastener prevents relative
16 motion between said anchoring assembly and said connector once
17 said anchoring assembly and said connector have been arranged
18 in a spinal-curve-correcting orientation and said linear
19 engaging fastener has been engaged without applying rotational
20 torque to said assembly.

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22 Claim 11. The anchoring assembly for use with a spinal
23 fixation system of claim 10 wherein said linear engaging
24 fastener includes;

1 a collet member having a base end, a top end, an inner
2 engaging surface, and an outer tapered compression surface
3 positioned about a central axis; and

4 a compression ring member having a base end, a front end,
5 a inner tapered compression surface, and an outer surface
6 positioned about a central axis;

7 wherein said inner tapered compression surface of said
8 compression ring member being constructed and arranged for
9 coaxial alignment and overlapping engagement with respect to
10 said outer tapered compression surface of said collet member,
11 said compression ring member linearly traversable with respect
12 to said outer tapered surface of said collet member between a
13 first release position and a second engaged position, wherein
14 said collet member is placed over said first end of said
15 linking member in said first release position and wherein said
16 engaged position results in said cooperating tapered surfaces
17 compressing said collet member and tensilely loading said
18 compression ring member thereby supplying said clamping force
19 and gripping the outer surface of said linking member.

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21 Claim 12. The anchoring assembly of claim 11 wherein said
22 first machined end of said linking member includes a tensioning
23 means; wherein said tensioning means is constructed and
24 arranged to allow said linking member to be tensilely loaded

1 prior to linear traversal of said compression ring member to
2 said engagement position with respect to said collet member.

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4 Claim 13. A method of constructing internal and external
5 surgical appliances using a plurality of polyaxial bone
6 anchoring assemblies, a plurality of connectors, and at least
7 one stabilizing rod wherein said appliances are assembled
8 without application of rotational torque to said polyaxial bone
9 anchoring assemblies, said method comprising the steps of:

10 supplying at least one bone-engaging member having a first
11 end adapted to engage said bone and a second end comprising a
12 substantially-spherical exterior surface, said second end
13 including a generally spherical retention cavity constructed
14 and arranged to engage a linking member;

15 supplying at least one linking member having a machined
16 first end and a substantially-spherical second end, whereby
17 said second end of said linking member is secured within said
18 spherical retention cavity to allow swivelling movement in
19 relation to said bone-engaging member;

20 supplying at least one auxiliary connector, said connector
21 constructed and arranged for attachment to at least one
22 stabilizing rod to prevent unwanted movement between said bone-
23 engaging members;

1 supplying at least one stabilizing rod, wherein said
2 stabilizing rods are rigid members shaped to form a correcting
3 path, wherein said stabilizing rod has a sufficient length to
4 span between at least two of said polyaxial bone anchoring
5 assemblies;

6 supplying a support collar for each of said linking
7 members, said support collars having a centrally located
8 passthrough aperture, a first upper surface and a second lower
9 surface, said second lower surface constructed and arranged to
10 cooperate with said exterior surface of said second end of said
11 bone engaging member, said first upper surface constructed and
12 arranged to cooperate with said at least one auxiliary
13 connector;

14 supplying at least one linear engaging fastener means,
15 said linear fastening means being constructed and arranged for
16 coaxial alignment and overlapping engagement with respect to
17 said second machined end of said linking member, said linear
18 fastening means linearly traversable with respect to said
19 second machined end of said linking member between a first
20 release position and a second engaged position, wherein said
21 linking member is placed over said second machined end of said
22 linking member, wherein said engaged position results in
23 tensile loading said linking member and thereby supplying a

1 clamping force for gripping said machined end of said linking
2 member.

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4 Claim 14. A process for creating a spinal fixation
5 assembly comprising:

6 providing a polyaxial bone screw having a first end
7 constructed and arranged for threaded engagement in a spinal
8 bone by application of an effective amount of rotational
9 torque, and a second end constructed and arranged for
10 swivelable attachment of a linking member, said linking member
11 having a first end constructed and arranged for attachment of
12 a connecting member and a second machined end constructed and
13 arranged for swivelable attachment to said second end of said
14 bone screw;

15 providing a connecting member constructed and arranged for
16 adjustable positioning about said linking member machined end;
17 and

18 providing a linear fastener constructed and arranged to
19 provide positive compressive attachment of said connecting
20 member and said linking member machined end;

21 applying a non-rotational, linear force to said linear
22 fastener effective to fixedly engage said fastener about said
23 anchoring element proximal end to produce and maintain a

1 clamping force effective to produce a spinal fixation assembly
2 having a fixed orientation;

3 wherein said linking element is fixedly engaged about said
4 anchoring element without the application of rotational torque.

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